arity, which have been applied so fruitfully in aeronautics, receive attention in chap. xi., and cover the ground rendered familiar to us by the reports of the Advisory Committee for Aeronautics.

The remainder of the book is conventional hydrodynamics, and is a further reminder of the pack of success which has attended the efforts of mathematicians and others to solve the problems of the motion of fluids under conditions resembling those of normal occurrence. As a summary of formulæ the chapters have a value to advanced students.

Taken as a whole, the book is one to be recommended to those students on whom the future developments of aviation will depend, for it contains the fundamental theorems on which the science of the subject rests and must continue to rest for such period as we can now visualise.

Text-books on Chemistry.

(1) *Treatise on General and Industrial Inorganic Chemistry.* By Prof. Ettore Molinari. Second edition. Translated from the fourth revised and amplified Italian edition by Thomas H. Pope. Pp. xix+876+2 plates. (London: J. and A. Churchill, 1920.) Price 42*s.* net.

(2) *Trattato di Chimica Generale ed Applicata all' Industria.* Vol. ii. *Chimica Organica.* By Prof. Ettore Molinari. Parte Prima. Terza edizione riveduta ed ampliata. Pp. xix+624. (Milano: Ulrico Hoepli, 1920.) Price 28 lire.

(3) *A Text-book of Inorganic Chemistry.* Edited by Dr. J. Newton Friend. Vol. ix. Part 1. *Cobalt, Nickel, and the Elements of the Platinum Group.* By Dr. J. Newton Friend. (Griffin's Scientific Text-books.) Pp. xvii+367. (London: Charles Griffin and Co., Ltd., 1920.) Price 18s.

(1 and 2) DR. ETTORE MOLINARI is professor of industrial chemistry at the Royal Milan Polytechnic and at the Luigi Bocconi Commercial University in the same city, and his treatises on inorganic and organic chemistry are, apparently, mainly directed to the special character of his teaching in those institutions. Here chemical theory, in effect, is wholly subordinated to practical application, and the books are simply descriptive manuals of chemical technology, adapted to the needs of polytechnic students and suitable for general reading. They may be said to occupy a position intermediate between the general treatise on chemical theory and the specialised handbooks on chemical technology. Prof. Molinari goes so far as to say that his books reflect the change which has come over the teaching of modern chemistry. In his opinion the methods and spirit of the teaching of Liebig, Hofmann, and Kekulé no longer correspond with present-day requirements. The "beneficent impulse" which these great teachers gave to chemical studies was, we gather, too exclusively "scientific" and "theoretical." The author, however, is a little unfortunate in his argument. He could scarcely have selected three names more alive to the utilitarian aspects of chemical science, however mindful they might be of the primary purpose of their calling and profession. The whole development of certain great branches of applied organic chemistry may be said to have sprung directly from the teaching and example of Liebig, Hofmann, and Kekulé. Liebig's genius ranged over practically the whole field of the industrial chemistry of his day; Hofmann early threw himself, with characteristic zeal and energy, into the newly created synthetic colour industry, the enormous extension of which is fundamentally based upon Kekulé's fruitful conception.

Prof. Molinari insists that "general chemistry can no longer be a simple and arid exposition of fundamental laws and of the properties of the innumerable known substances, but should possess a soul which brings it into contact with the vital activities around which it clings." "The chemical text-books which have been used up to the present time do not correspond sufficiently with these requirements." "The present treatise took its rise from these considerations, and has no other pretensions than to be an attempt to initiate a work of reform in the teaching of chemistry."

These excerpts are taken from the preface to the first edition of the former of Prof. Molinari's two works cited above, in which the author sketches the general plan of his work and makes his *apologia* for its special character. In the preface to the fourth Italian edition, on which the present English edition is based, he enforces his point of view. The Great War, he contends, "has emphasised the necessity of developing chemical teaching more and more along the lines of its practical applications." Hence he has been led "to treat the material still more from the industrial standpoint." Various chapters have been considerably enlarged, "certain improvements—presumed or real—being indicated only by the numbers of the patents in question, so that the further details may be ascertained from the journals of applied chemistry." Considering the class of person to whom the work is ostensibly addressed, a list of patents restricted to their numbers, with a general reference to technical journals in which further particulars may possibly be discovered, is of no great educational value. The extension of his principles has, in fact, led the author into an *impasse,* and by carrying it still further on similar lines his volumes threaten to become unwieldy and their material ill-digested.

Although we have no great sympathy with the spirit which has actuated the author in the compilation of these treatises, and, indeed, may be said to pervade them, in bare justice it must be admitted that they contain a great mass of useful facts, and the reader who will steadily work through their 1500 pages will acquire a considerable stock of information on general industrial chemistry. But we question whether this is quite the *pabulum* on which to feed the young chemist, even if intended for technology. Prof. Molinari thinks that the slow progress, and even the ruin, of many Italian chemical industries are to be attributed to the erroneous direction of chemical training in the universities. Nevertheless, this training was presumably modelled on that of French and German schools of chemistry, and similar evil results have not followed in France or Germany. There must be other causes—social, economic, temperamental—to account for the general lack of success of which the author complains. We seriously doubt if it will be remedied in the manner he indicates. The experience of every other country in Europe which has acquired a commanding position in chemical industry is against him. It is only in America that a similar sentiment has been seen, and, until comparatively recently, America has shown no great aptitude in creating chemical industry. Now, thanks to the enormous development of chemical teaching of a university type in the United States, a great impetus has been given to the higher branches of chemical technology, especially since the war, and largely owing to the collapse of Germany. But the system of chemical training in the best American institutions is not markedly different from that which prevails in the leading European schools. Japan affords a like example. Practically all her leading teachers and technologists have been trained in Continental laboratories, and have introduced their systems into the Japanese universities and technical institutes. It would be interesting to know the views of such eminent Italian chemists as Paterno, Ciamician, and Nasini concerning Prof. Molinari's surmise as to the cause of Italy's backward condition in chemical industry. We should be surprised to learn that they would attribute it to faulty methods of teaching the science and theory of chemistry. It may turn out to be due to a superficial system of instruction in chemical technology, in which chemical theory is insufficiently considered and the methods and practice of chemical manufacture are imperfectly expounded.

(3) Vol. ix. of the "Text-book of Inorganic Chemistry" edited by Dr. Newton Friend is concerned with the elements of Group viii. of the Periodic Table, on which system of classification the entire work is based. The volume is divided into two parts, of which this instalment is the first. It deals with cobalt, nickel, and the metals of the platinum group, six in number. Strictly speaking, this is a departure from the plan uniformly followed in the preceding volumes, in which the element of lowest atomic weight in the several groups is treated of first; in this case it should be iron. It is proposed, however, to deal with iron and its compounds in a separate section forming part ii. of this particular volume. There are, no doubt, good reasons for this course. Iron occupies an exceptional position, and the space needed for its consideration may well necessitate a special section. But this fact does not necessarily require any alteration in the established plan of sequence—viz. that the element of lowest atomic weight should take precedence of its fellow-members in the group. We surmise that the only reason for the change in treatment was that on account of "the enormous amount of research" that has been carried out in connection with the properties of iron and of its compounds, delay has occurred in putting together the material. It is, of course, a small matter, and leads to no practical inconvenience. But in the interests of uniformity it is worth rectifying, which can easily be done in a later edition of the entire work.

The present volume well maintains the reputation which its predecessors have conferred upon the work as a whole. In general plan and arrangement and method of treatment it is similar to these. It opens with a chapter on the general characteristics of the elements of the group with which it is concerned. The anomaly in the position of cobalt in the Periodic Table is duly pointed out. In the table cobalt is placed between iron and nickel, although the bulk of experimental evidence goes to show that the atomic weight of cobalt is distinctly greater than that of nickel. No sufficient explanation of this anomaly has been given. It is one of those apparent exceptions to the universality and comprehensiveness of the doctrine which await solution. Similar difficulties have occurred before, and subsequent research has removed them. A case in point was met with in other members of the same group. When Mendeléeff enunciated his generalisation the accepted atomic weights of osmium, iridium, and platinum were found to be not in accordance with the previsions of the law, and Seubert showed that Mendeléeff's surmise that the numbers were inaccurate was correct. The proper sequence of the elements has now been established, although we concur with Dr. Friend that, with the exception of that of platinum, which, thanks to the careful experiments of Archibald, published in the Proceedings of the Royal Society of Edinburgh, is now well determined, the values of the other members, especially of osmium and iridium, fall very far short of the standard demanded by modern atomic weight work.

It may be hoped that we shall not have long to wait for new and more accurate determinations. These elements, it is true, present special difficulties, accentuated, no doubt, by the present scarcity of material. Indeed, the term "rare elements," originally applied to some of those of Group iii., is in these strenuous and evil days more appropriate to the members of the platinum group.

We presume that part ii., devoted to iron and its compounds, will complete the entire work of ten volumes, when we hope to be able to congratulate Dr. Friend and his coadjutors on the termination of their task. The complete treatise will form an admirable contribution to the chemical literature of this country, philosophical in plan, comprehensive in treatment, and accurate in detail, not the least of its merits being its excellent bibliography.

Our Bookshelf.

Practical Plant Biochemistry. By Muriel Wheldale Onslow. Pp. vii + 178. (Cambridge: At the University Press, 1920.) Price 15*s.* net.

THE author indicates that her book is primarily intended for students of botany, and that it should be a guide to practical work. It is stated that the volume is planned to supplement the knowledge of plant products which students obtain in their study of organic chemistry and of plant physiology. The introduction is followed by eight chapters, each giving a brief survey of some portion of the chemistry of plant life—*e.g.* the colloidal state (chap. ii.), carbon assimilation (chap. iv.), glucosides and glucoside-splitting enzymes (chap. ix.). The general matter of the chapters is followed by, or interspersed with, data upon which experimental work can be carried out to illustrate the points dealt with in the respective chapters. A list of references to original literature is given at the end of each chapter, and cross-references are frequently employed. As to errors, it is rather surprising that those in the structural formulæ for α- and β-glucose on p. 48 (where the formulæ are used to illustrate a statement concerning the two forms) should have been overlooked.

The chapter on plant bases (chap. x.) consists rather too largely of a list of names, to which are attached complex structural formulæ that are more likely to confuse the students who have "an elementary knowledge of organic chemistry" than to be of assistance to them. But for the somewhat disjointed effect resulting from the method of introducing the experimental instructions, the matter is presented in an interesting form, and on the whole there is a pleasing freedom from dogmatic assertions concerning unknown or uninvestigated chemical changes, which so frequently detract from the value of works of this type. The general survey of the problems involved in the chemistry of plant life, and the instructions for experimental work which this volume contains, should prove both useful and interesting to the class of student for whom it was written, and to many others who are interested in the chemistry of the plant world.

A. E. E.

Vergleichende Anatomie des Nervensystems. Erster Teil., Die Leitungsbahnen im Nervensystem der Wirbellosen Tiere. Von Æ. B. Droogleever Fortuyn. Pp. viii + 370. (Haarlem: De Erven F. Bohn, 1920.) 12.50 guilders.

THE author is to be congratulated on this excellent digest of the known facts regarding the paths of conduction in the nervous system of invertebrates—a work which has entailed careful reading of the extensive and complicated literature of the subject and skilful collation of the results. He gives an account of the principal issues of the researches—treated for the most part in historical sequence—on the arrangement of the sensory cells and ganglion cells and the course of their processes, so far as this has been ascertained, in each phylum of invertebrates. The internal structure of the cell and the intracellular neurofibrillæ are not discussed. After dealing with the Porifera in less than a page, there being no evidence of the presence of nervous elements in sponges, the author examines in turn the Cœlentera, Vermes, Mollusca, Echinoderma, Arthropoda, Bryozoa, Tunicata, and Amphioxus, the last-named being included because its nervous system presents a number of features in common with that of invertebrates. In some cases—*e.g.* Echinoderma, Bryozoa, Tunicata—our knowledge of the paths of conduction is extremely slight, but in others —*e.g.* Annelida and Decapod Crustacea—there is an extensive literature which has received full consideration. The digest, illustrated by 116 diagrams, shows clearly what has been done, and renders obvious how much still remains to be done to elucidate the detailed structure of the